User manual

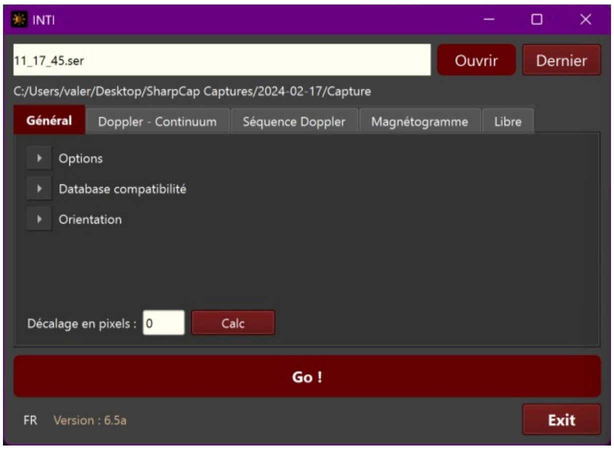
INTI V7

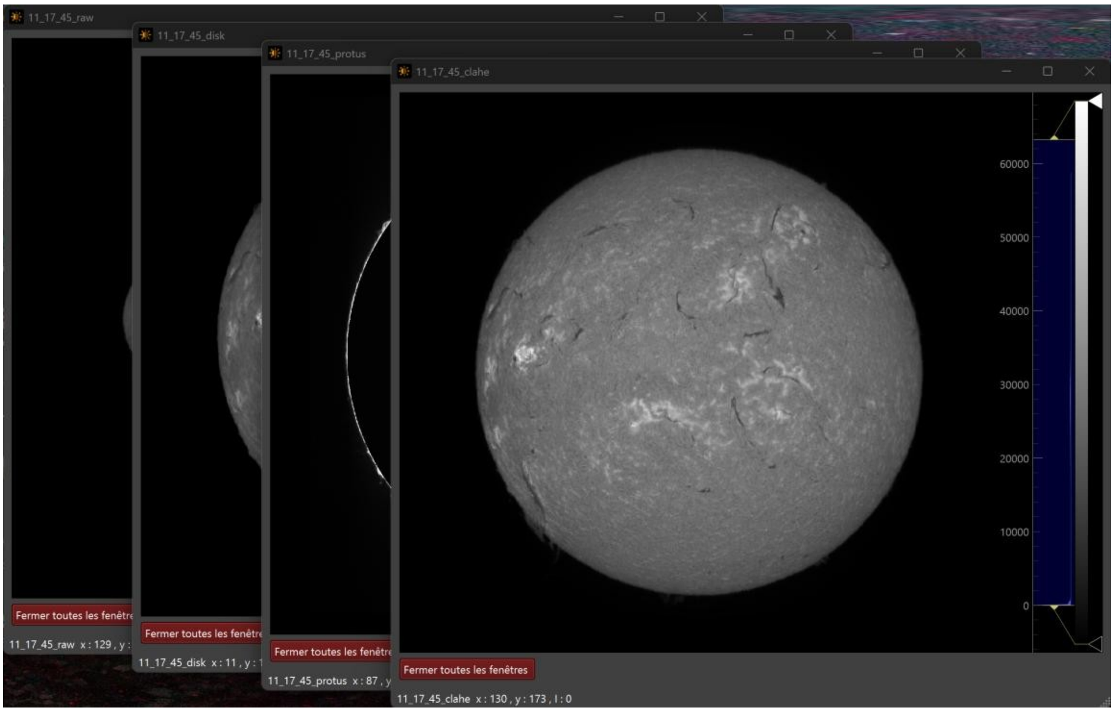
INTI is the first application for amateurs that automatically generates an image from spectroheliograph scan files. It is the native application for the Sol'Ex spectrograph, but can also be used with other SHGs whose geometry is inspired by Sol'Ex. Particular attention has been paid to the quality of the images produced, while minimizing overprocessing. Its streamlined interface offers the essential functions for an observer during an acquisition session. For clarity, the post-processing and analysis functions are available in a separate software program: Inti_partner.
observer during an acquisition session. For clarity, post-processing and analysis functions are available in a separate software package: Inti_partner.

INTI processes video files in 16-bit or 8-bit black and white format.

The INTI experience

Upload one or more SER files, click Go! and get your images.





Installation

1. Download the zip file

For Windows: http://valerie.desnoux.free.fr/inti/inti-window.zip

For Mac: http://valerie.desnoux.free.fr/inti/inti_macos.zip and refer to the appendix of this document for managing permissions for non-Apple-certified software.

For Linux: http://valerie.desnoux.free.fr/inti/inti-linux.zip - as there are various Linux distributions, the compilation provided is for the latest version of Ubuntu.

2. Extract the inti directory to your hard drive or a USB flash drive.

Once unzipped, you will obtain a directory containing an _internal directory containing a number of files and the inti.exe executable.

3. Click on INTI.exe to launch the application

The exe file is located in the unzipped directory.

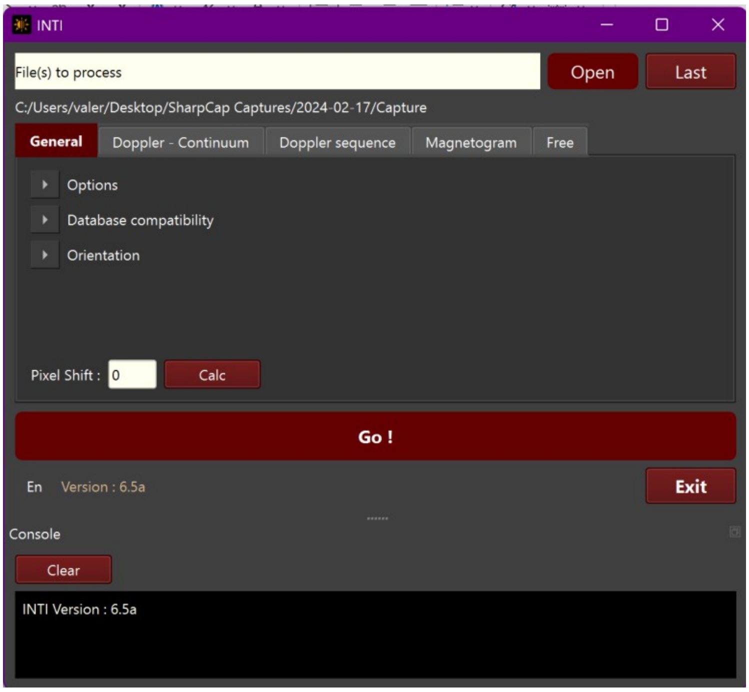
The user interface may take ten seconds or more to appear, particularly on Mac OS, and less time when launched for the second time.

When launched, Windows does not recognize any signature and may therefore display a warning to protect your PC from viruses and prevent the program from running. Trust the program and force Windows to run it anyway.

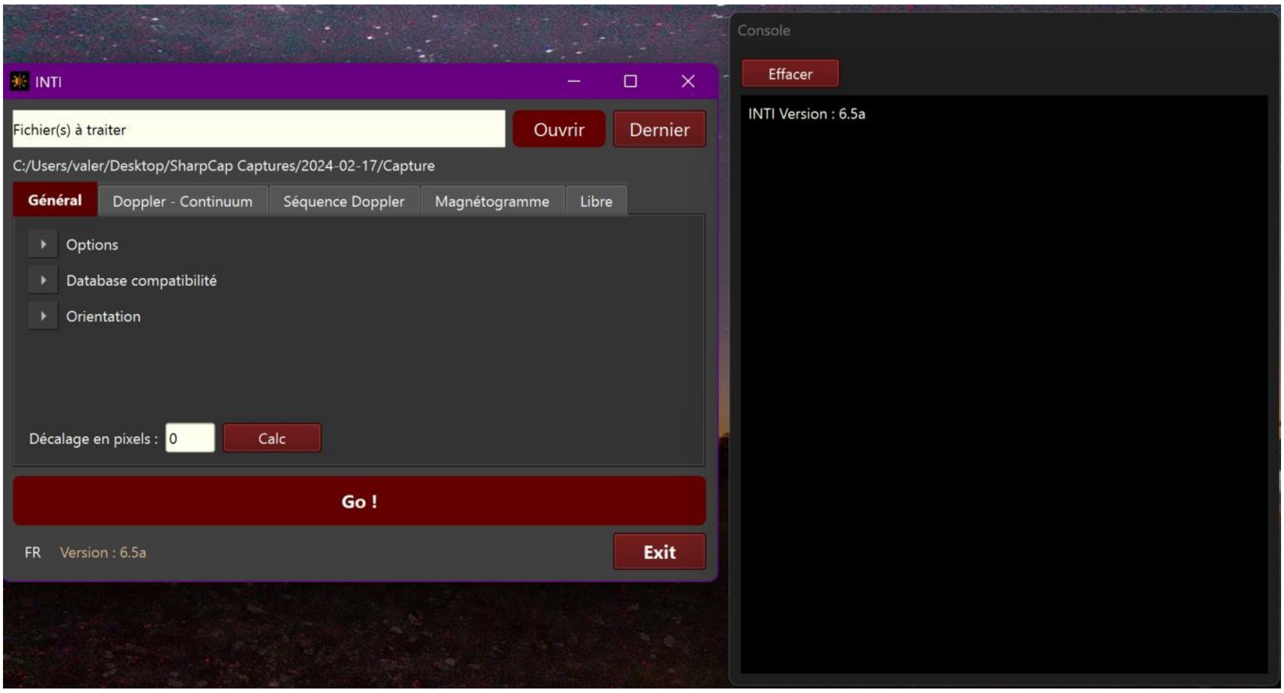
If you encounter problems with the inti.yaml file, please delete it and restart the program. Make sure the directory has write access.

Overview

When launched, the window below appears. It consists of a tabbed area and a panel at the bottom (dock) called Console, which will display information throughout the processing.



The application window can be enlarged. The console can be independently placed on the left, at the bottom, or even detached as an independent window. To do this, click near the title and the three small dots and drag while holding down the mouse button. To re-dock the floating console, double-click on the title bar.



The application remembers your interface layout for the next launch. Language

management

To change the default French language to English, click on the 'FR' button, then restart the application.

Version check

If you have an internet connection, the application checks the current version number on the website . If the version is different, the version color changes to red.

Tabs

Each tab corresponds to a SER file operating mode. This allows you to easily view the settings and directly access the specific processing function.

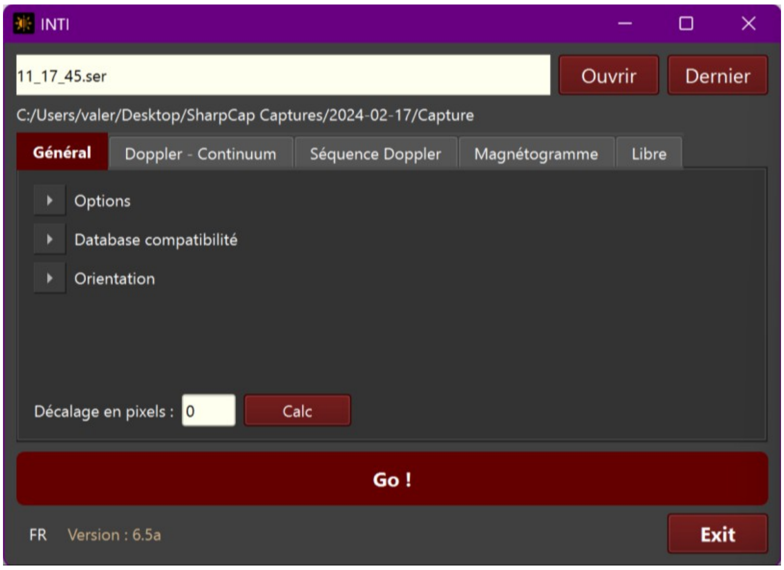
In the first tab, "General," a number of options/configurations are available to modify your preferences.

General processing

Click "Open" to access the file directory. Pressing the space bar space bar also allows you to access the file selection.

Select the file(s).

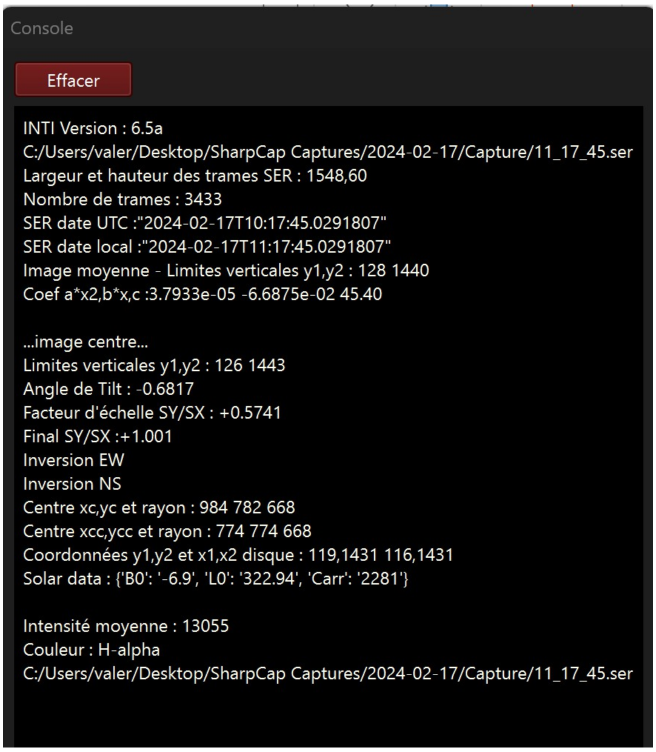
Click on the "Go!" button to perform the processing. You can also press the Enter/Return key to start processing.



The directory name is displayed below the file name area.

If the directory is defined, you can then process the last SER file in that directory using the "Last" button without having to select a file. This feature is very useful for checking the quality of your acquisitions during an observation session.

Throughout the processing, information is displayed in the Console. It will also be saved in a file named "SER_log.txt" in the same directory as your SER file.



INTI generates the resulting image by searching for the darkest spectral line in your acquisition from an average frame image. INTI then calculates the shape of the slit projected onto the image and uses this model to extract the intensities at the center of this line frame by frame. The "raw" image is then processed to produce a monochromatic, circular image of the solar disk:

- Correction of lines caused by impurities on the slit

- Correction of non-uniformities
- Geometry correction with tilt correction (scrolling angle not perpendicular to the slit)
- Correction of ovalization (slow or fast scrolling of the solar disk relative to the acquisition rate).

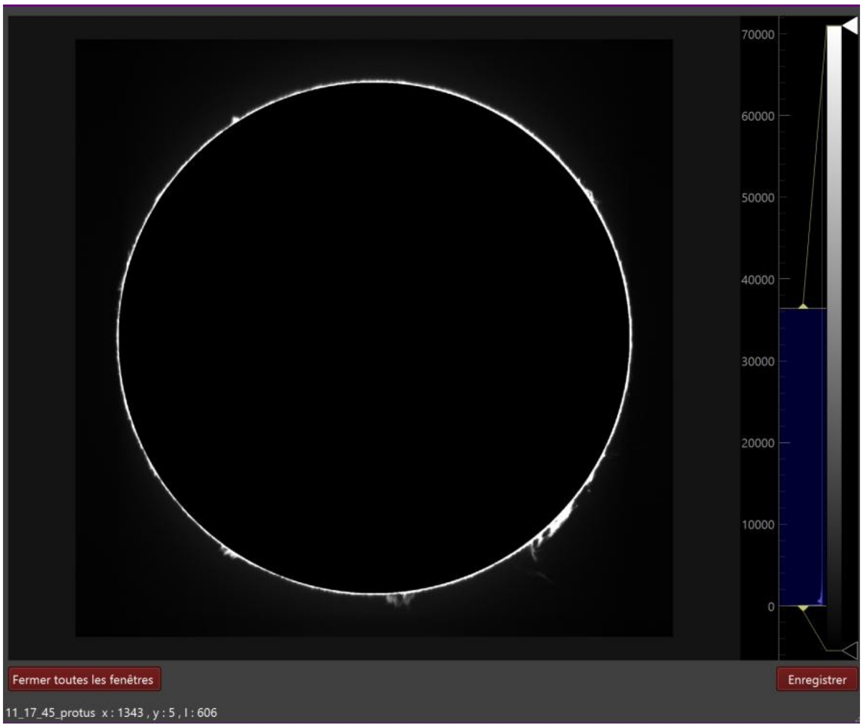
It is possible to generate an image at a wavelength slightly shifted by a few pixels from the center of the spectral line. To do this, enter a value in the "pixel shift" field.

At the end of processing, the resulting image files are displayed

- **Raw**: raw disk without transverse and geometric corrections - this is offered for quick verification after acquisition in order to adjust the exposure time/number of images per second to obtain a quasi-circular disk
- **Disk**: Final image with predefined contrast thresholds, without post-processing, or **Cont** if a shift has been requested.
- **Protus**: Final image with thresholds adapted for viewing low-intensity protuberances with a virtual occulting disk.
- **Clahe**: Final image with "Contrast Limited Adaptive Histogram Equalization" post-processing

Image window(s)

For each image:



With the mouse over the image, the mouse wheel can be used to zoom in and out of the image, and holding down the left button allows you to move the image within the frame.

Moving the mouse over the image allows you to view the intensity of the pixel you are hovering over in the x, y, Intensity display at the bottom of the window.

Right-clicking on the image displays a context menu that allows you to return to Display the entire image centered with "view all" and also export the image in png format with "export," in addition to the png image already saved by the application.

You can change the thresholds with the mouse by moving the sliders on the histogram on the right and even save this new image with the 'Save...' button. A log.txt file will be added with the name of this new file for use in Inti_Partner.

The mouse wheel can be used to zoom in on the histogram if necessary when the mouse is over the histogram.

The "Close all windows" button closes all image windows displayed at the end of the processing a SER file. You can also use the keyboard shortcut "Esc."

If you are processing a batch of files, the images are updated at the end of each file's processing. You can follow the progress of the processing in the title bar of the last window in the form: *name of the file being* processed... next *name of the next file* (n / number of files to be processed)

Exiting the application

Click on the "Exit" button to exit the application and save your default choices in the inti_ini.yaml file.

Result images and directories

You will find all the results in the directory of your ser file. The names of the processed files always begin with "_", followed by the name of the SER file without its extension.

INTI creates 3 subdirectories in your working directory

- **BASS2000**: saves the three files generated for download to BASS2000, two FITS disk and protus files, and the thumbnail in jpg format—only if the wavelength is selected in the "Database compatibility" panel—see the Database compatibility section in this document.
- **Clahe**: all png files processed by Clahe, for quick review
- **Complements**: raw files, averages, and other fits and png files of complementary images

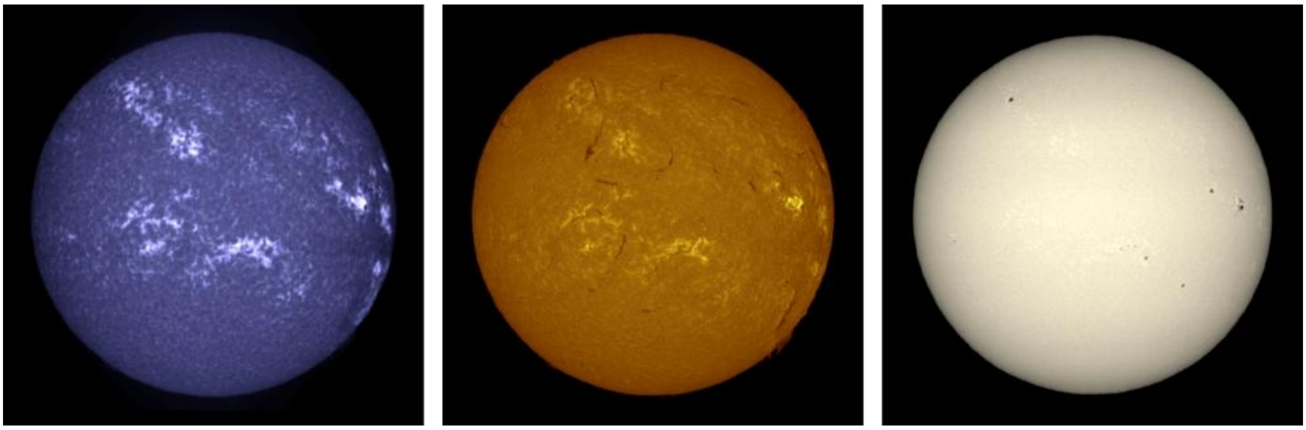
PNG images

- _disk.png: a view of the final image with predefined low contrast thresholds, or _cont.png if offset value entered
- _protus.png: a view of the final image with a black occulting disk to highlight
- _clahe.png: final image with the "histogram equalization by local contrast adaptation" post-processing applied, in the Clahe directory

Depending on preferences, other png images are generated.

- _color_xx.png: colorized image with 3 possible colors automatically chosen by Inti with color profiles for Calcium, H-alpha, or Pale (for the continuum)
- _raw.png: a view of the monochrome solar disk as scanned, constructed line by line, in the Complements directory – useful for analyzing the SER file in INTI Partner

- _grid.png: image with Stonyhurst grid, in the BASS2000 directory, if Stonyhurst is enabled in the advanced settings
- _inv.png: image with inverted thresholds
- _mix.png: mixed protuberance and disk image



Example of automatic colorization by INTI, from left to right: calcium image, H-alpha image, and continuum image

Fits images

- _recon.fits: final monochromatic fits image known as "reconstructed"
- _raw.fits: raw image, in the Complements directory
- _mean.fits: spectral image, average of all frames, in the Complements directory

Depending on preferences, in advanced processing modes, other FITS images are saved in the complements directory

- _mean_start.fits: free line mode (Helium), average spectral image around the moment of the appearance of the spectrum for automatic detection of an emission line.
- _diff.fits, _sum.fits, _x0,x1,x2: intermediate FITS images constituting a magnetogram
- Dop1, dop2, moy: intermediate images in N&B fits constituting the Doppler image

Dat file

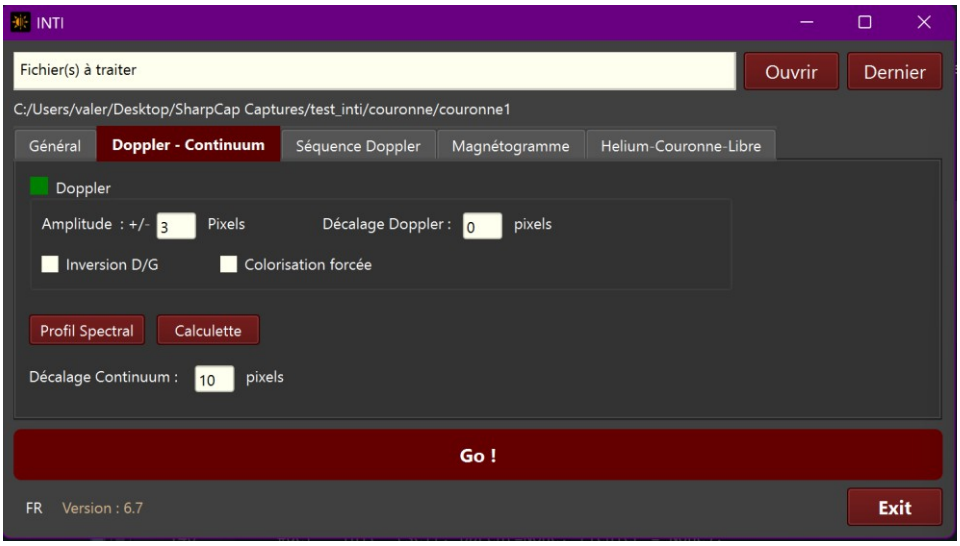
- .dat: spectral profile of the image _mean.fits in the Complements directory, can be visualized by Visual Spec, ISIS, Excel, etc.

Note: with the exception of Clahe images, no processing modifies the intensity ratio between pixels. No gamma, no enhancement.

Doppler and Continuum

In addition to the core image of the line, this reconstruction mode calculates a composite image called "Doppler" and an image shifted close to the spectral continuum for a classic image of sunspots.

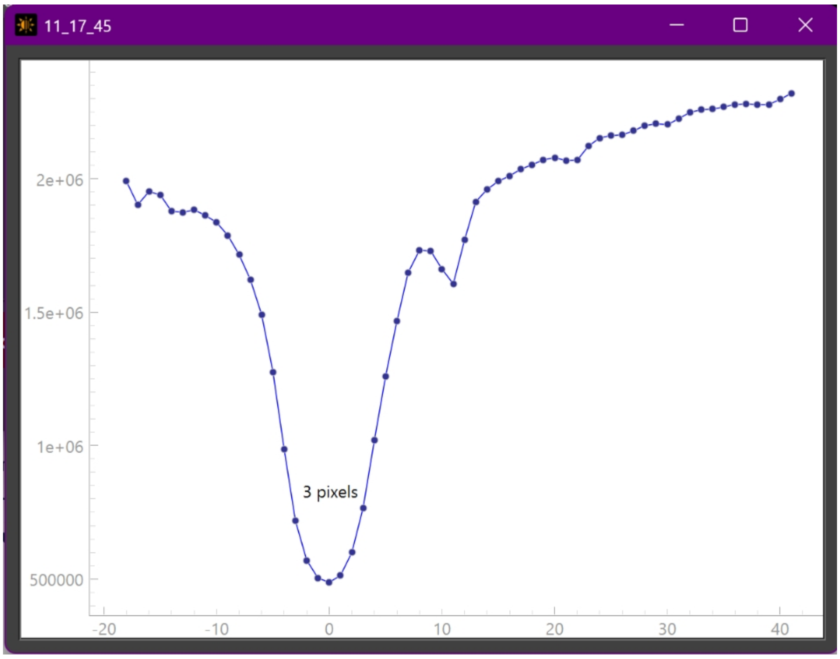
It is possible to reconstruct only the continuum image in addition to the image of the line core by disabling the Doppler option.



The Doppler image consists of two images with the same wavelength shift on either side of the central wavelength. The value is defined in the Amplitude field. The Doppler shift allows the Doppler values to be offset. The final color image is composed of +n pixels in the red plane of the image, -n pixels in the blue plane of the image, and the average image (R+B / 2) in the green plane, with intensity normalization.

An amplitude of 3 pixels calculates images at -3 pixels and+ 3 pixels relative to the center of the line. A Doppler shift of 1 pixel will calculate images at -2 pixels and+ 4 pixels.

To help you understand the shape of the line and the position of the Doppler shifts, you can display the average spectral profile using the "Spectral Profile" button and click on one of the points on the profile to see its shift relative to the center of the line. If the SER file has never been processed, this profile file is not available. The .dat file is saved in the "Complements" directory.

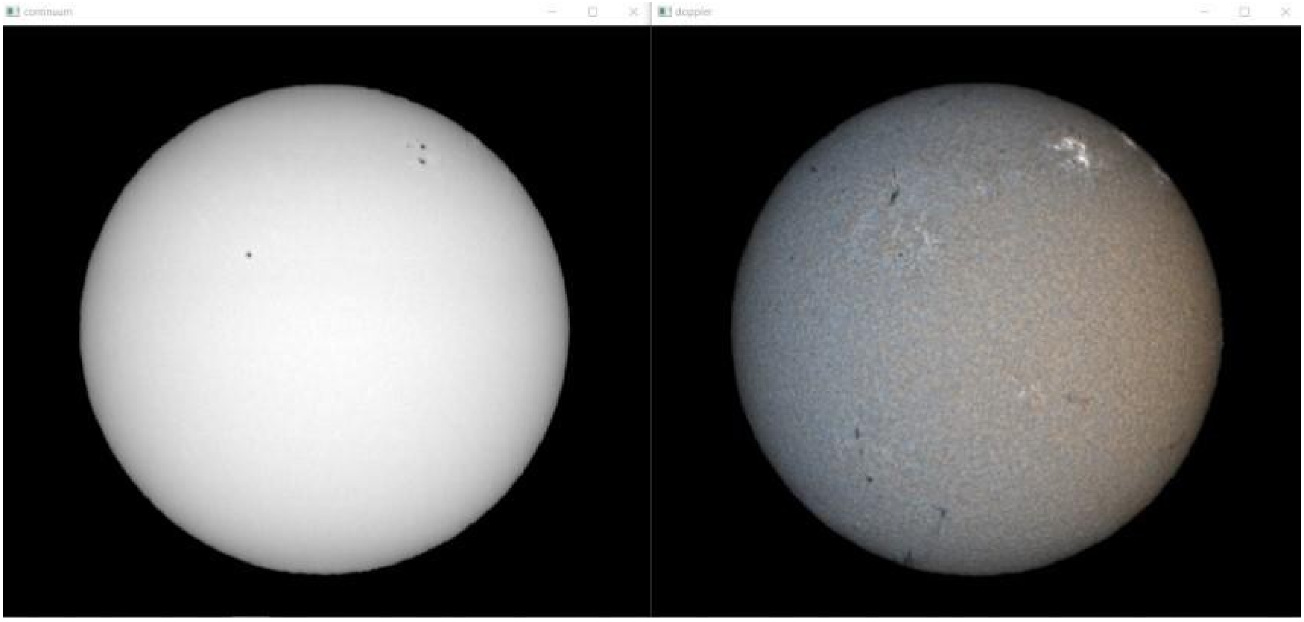


You can also reverse the order of the blue and red wings using the G-D inversion option, as this depends on the scanning direction during acquisition.

At the end of processing, if no errors are detected, you will obtain two png images that will be displayed and saved with the extensions _doppler.png (color image) and _cont.png for the continuum image.

– The image of the protuberances is also generated from the Doppler image with thresholds adjusted to visualize the Doppler effect.

A Doppler mode with very intense colors is available to force the colors to red-red and blue-blue.



Left: continuum image, right: Doppler image.

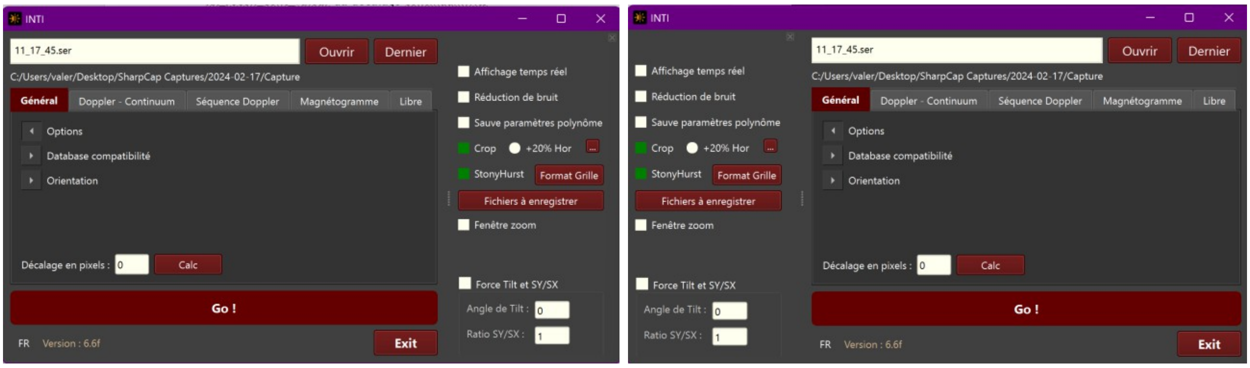
Three FITS images will also be created:

- *xx_recon_cont_continuum_shift_value*.fits
- xx_recon_dp_-amplitude value.fits (Image at – n pixel)
- xx_recon_dp_+amplitude value.fits (Image at+ n pixel)

If the pixel offsets are ultimately outside the image along the slit length, an error will be reported.

Advanced options and preferences

If you click on the Options section of the General tab, a panel appears on the right. Like the console, this panel can be moved but cannot be detached from the application.



Interface configuration with panel on the right or left. By default, the panel is on the right.

Advanced options panel

Real-time display: INTI will display a live, line-by-line reconstruction of the disk from the scan. This will take longer, but you will see the disk being constructed in real time with the corresponding spectral video. Very useful for demonstrating the principle of the spectroheliograph.

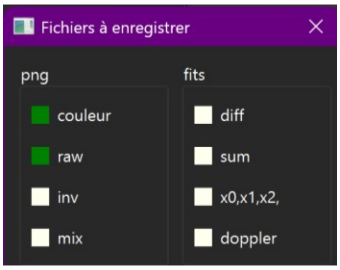
Noise reduction: activates the average of 3 pixels around the core of the line. Reduces noise but also reduces spectral resolution.

Save polynomial parameter: In certain special modes, Magnetogram or Free Line, you may have a deep and strong line next to the weaker line that interests you but is not visible during acquisition in the area of the line of interest. You can use this deep line to calculate the polynomial in general mode and transfer its parameters to special modes. This option is not saved in the inti_ini.yaml file for security reasons.

Crop: Forces automatic centering and cropping of the image. An option allows the automatic calculation to add 20% to the horizontal dimension if, for example, a protrusion extends beyond the frame in normal crop mode. The small button with '...' gives access to manual crop input in extreme cases.

Stonyhurst: This option generates a Stonyhurst grid superimposed on the solar image. You can adjust its colors and format options using the "Grid Format" button. It is also possible to perform this operation retrospectively in INTI-Partner with the option of adding annotations.

"Files to save" button: optional png and fits file saving preferences – by default, negative and mixed png images are not automatically generated. Fits images can be useful in special magnetogram, free line, or Doppler modes when fine-tuning the acquisition protocol.

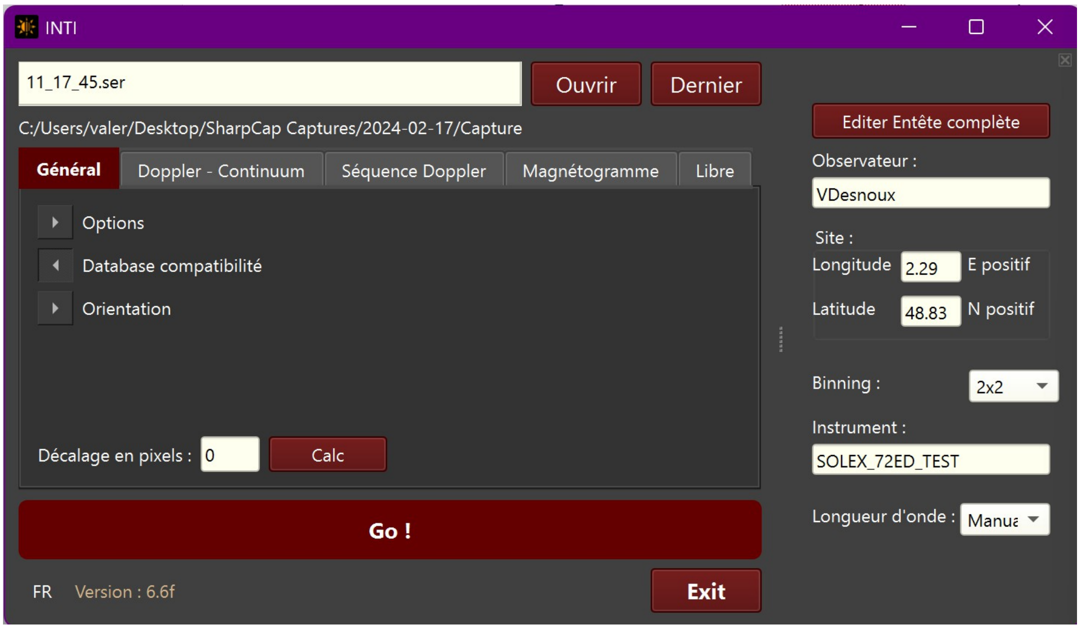


Zoom window: displays a mini window of the image (300x300 pixels) in the native format of the area overlaid by the mouse on the result images without having to use the mouse wheel or panning.

Force Tilt and SY/SW: Forces a SY/SX scaling value and tilt angle—the latest values are saved in the inti_ini.yaml file—if this option is not checked, the values are not taken into account and will be automatically calculated by INTI and displayed in the Console.

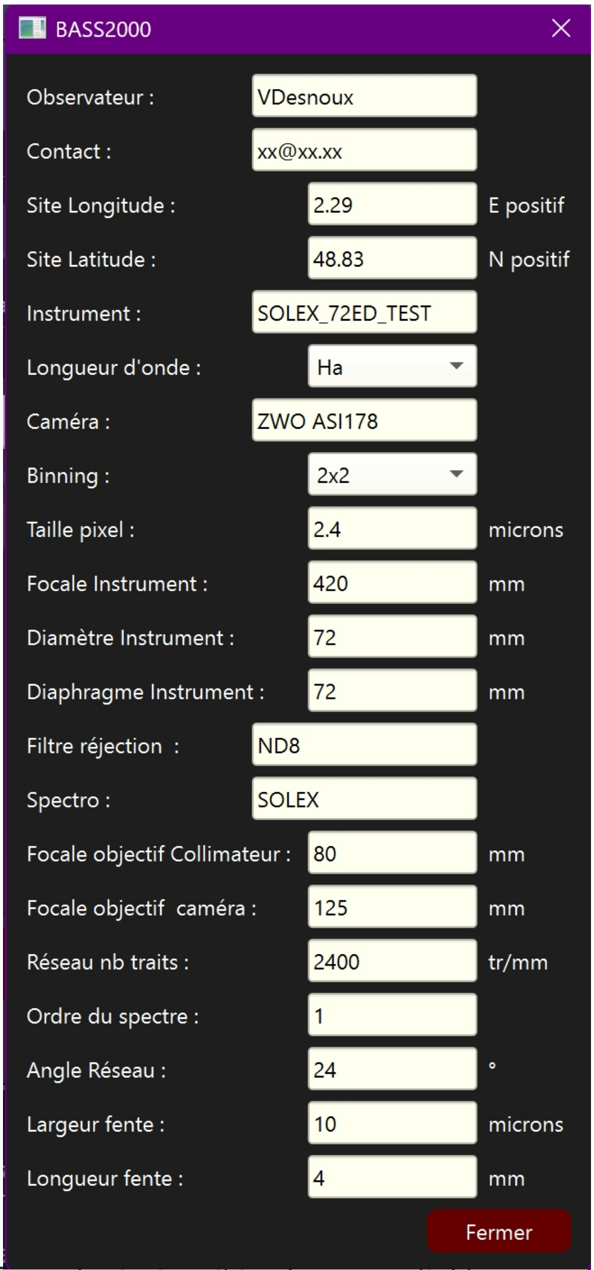
Database compatibility

This panel allows you to add data to the fits header to be compatible with the criteria of the SOLEX database of BASS2000, a database of systematic professional observations administered by a team from the Paris Observatory in Meudon, the SOLAP database.



Information that may change between observation sessions is directly accessible in this panel: observation site, binning value, instrument name, and observed wavelength.

However, other parameters are required and can be accessed using the "Edit Full Header" button. But if you do not change the spectrograph or optical instrument, they do not need to be modified.



All parameters are displayed, including those from the previous panel, to ensure consistency of information. Refer to the BASS2000 operator manual (French – English).

Observer name, email address, site coordinates, and instrument name.

Selection of the observed spectral line – the list complies with BASS2000 specifications. If the selection remains "manual," no BASS2000 image will be generated. However, the selection remains if you process a sequence in a session but is not retained if you restart the application in order to limit labeling errors.

Pixel value and binning of your acquisition.

Diameter and focal length of the optical instrument, diameter of the diaphragm if you have installed one. Otherwise, enter the aperture value without the diaphragm.

Energy rejection device, neutral filter, or helioscope.

Spectroheliograph model if validated by Meudon.

Focal length of the collimator lens, camera lens, angle of the grating, number of lines, order of the spectrum

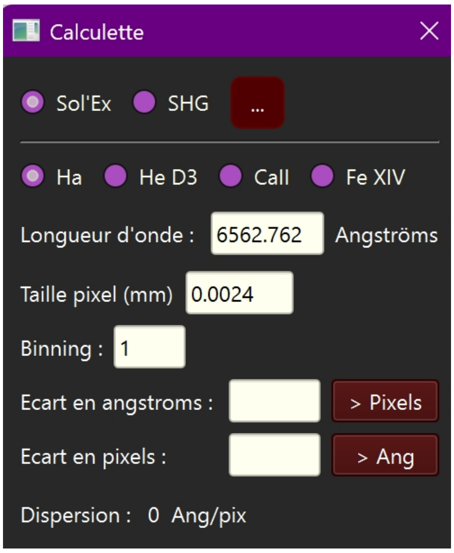
Slit, length, and width

For submission, it is also essential to correctly orient the solar disk in accordance with solar community conventions. This orientation is facilitated by the Orientation panel.

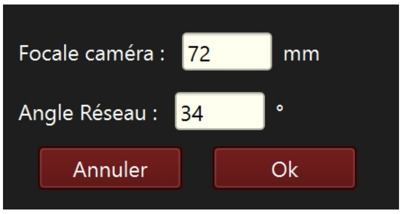
Calculator

To check and convert the pixel offset for the requested continuum images to angstroms, you can use the calculator by clicking on the "Calculator" button in the General tab. Please note that the dispersion functions are specific to the optical geometry of Sol'Ex or equivalent SHG, respecting the original optical configuration.

Select the spectral line—enter the pixel size and binning value. Enter either a value in Angstroms and click on the ">pixels" button to convert it to pixels, or a value in pixels and click on the "> ang" button to convert it to Angstroms. These calculations are specific to the optical geometry of Sol'Ex.



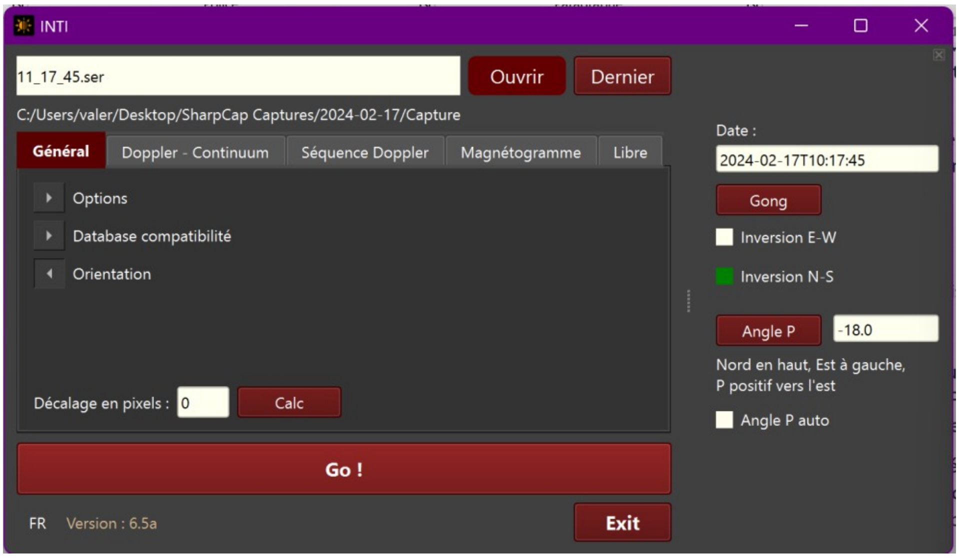
You can set the parameters for an SHG slightly different from Sol'Ex using the "..." button.



Only the camera lens parameters and the network angle define the dispersion values.

Orientation

This panel provides assistance in correctly orienting the solar disc.



The convention for orienting the solar disk is: solar (or heliographic) north pole at the top - East on the left. The solar north pole differs from the geographic north by an angle called **angle P**. This angle is calculated internally by INTI based on the UTC date stored in the SER file header.

By default, INTI does not apply the P angle to the generated images. However, it is possible to apply this angle correction systematically by enabling the **Auto P Angle** option. BUT, the orientation will ONLY be correct if the North-South and East-West inversions are correct. It will not be applied to partial disks or to Magnetogram or Helium images with transversallium correction.

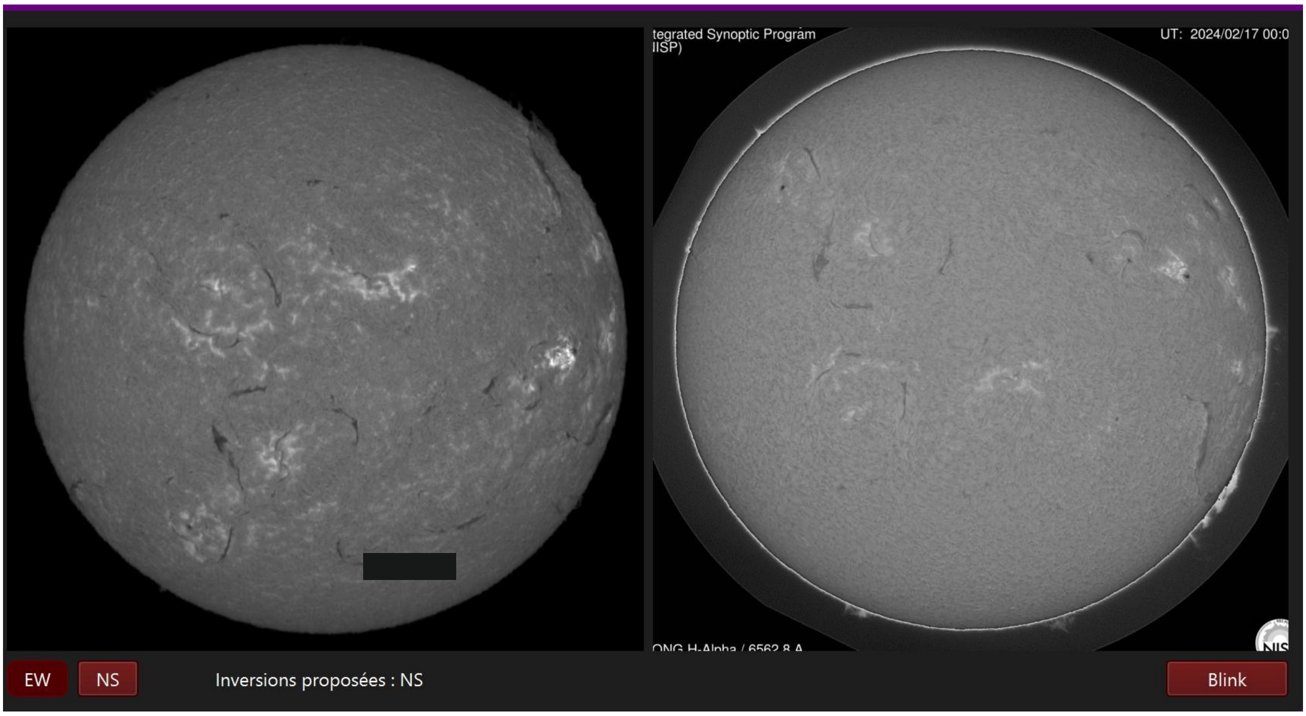
To determine the **NS and EW inversions**, you can compare with the Gong network image closest to the date and time. (This requires an active internet connection). Click on the "**Gong**" button. A comparison window will appear. It contains the _disk.png image on the left and the Gong network image on the right.

Click on the EW and NS inversion buttons to find the correct orientation to apply. The inversions will be imported directly into the main interface when the comparison window is closed.

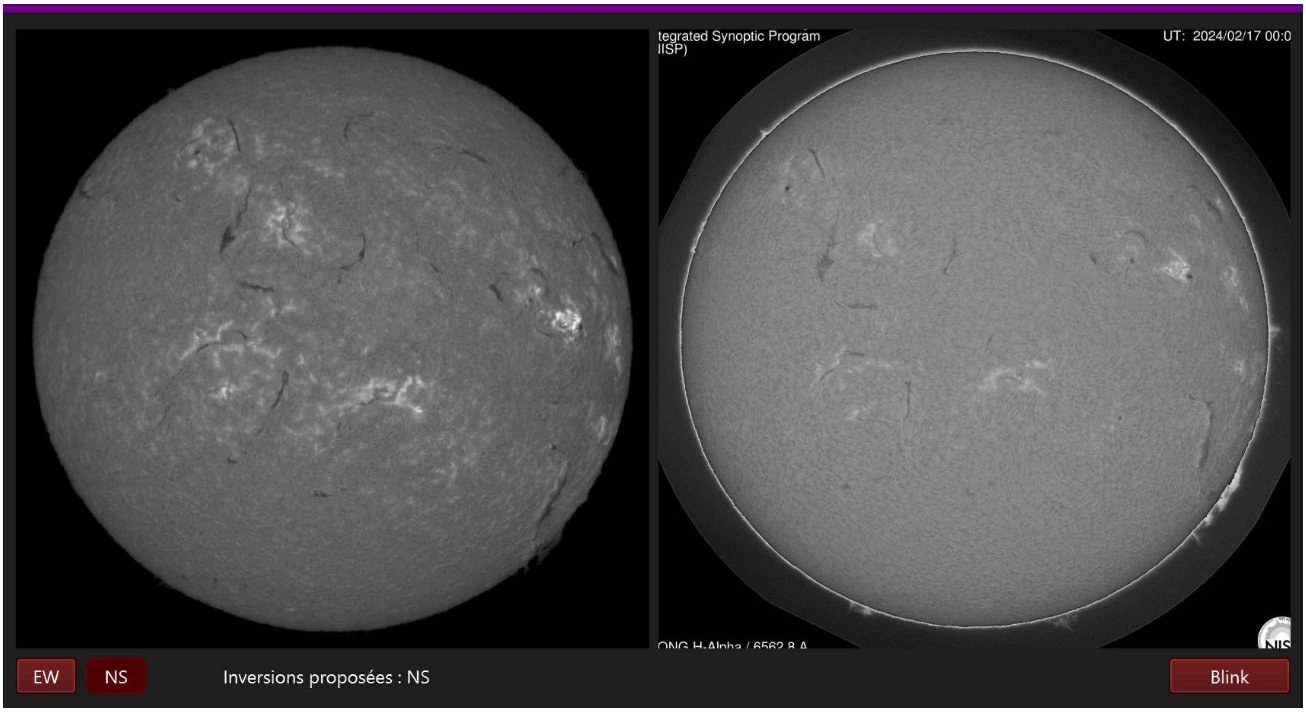
A "**Blink**" button allows you to alternate between the Gong image and your image in the right-hand frame.

You can resize the window with the mouse. This setting will be saved.

Note that an algorithm compares the two images and suggests the necessary inversions. As some images in the Gong network have low contrast, this suggestion must be verified and only applies to H-alpha images.



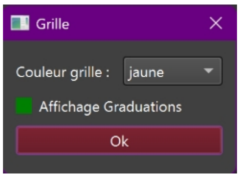
Comparison of processed image and Gong image. The proposed inversion is NS – click on the NS button to check

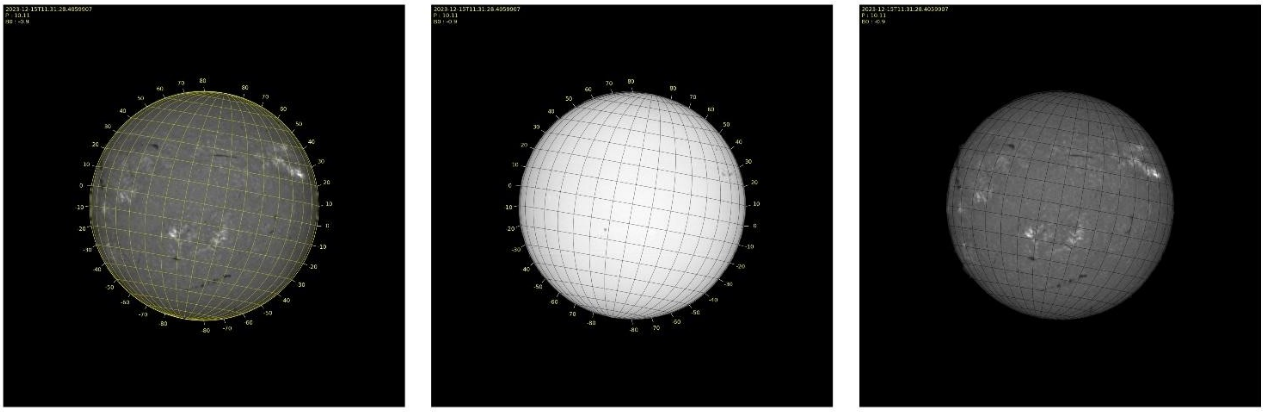


The processed image is oriented according to the proposal; check that it is consistent with the Gong image

Stonyhurst grid

If the Grid option is enabled in the options panel, an xx_grid.png file is saved in the BASS2000 directory. The grid format is defined using the "Grid format" button in order to adapt the colors and display options to the images. This grid is used to locate and track the position of active centers. Note that it is possible to recalculate this grid and add annotations with Inti Partner after your acquisitions.



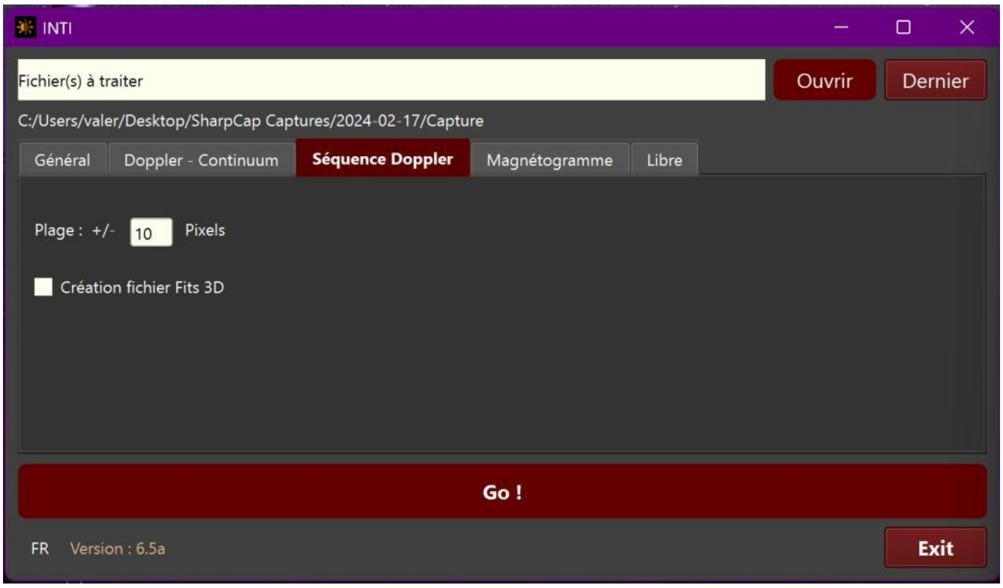


Doppler sequence

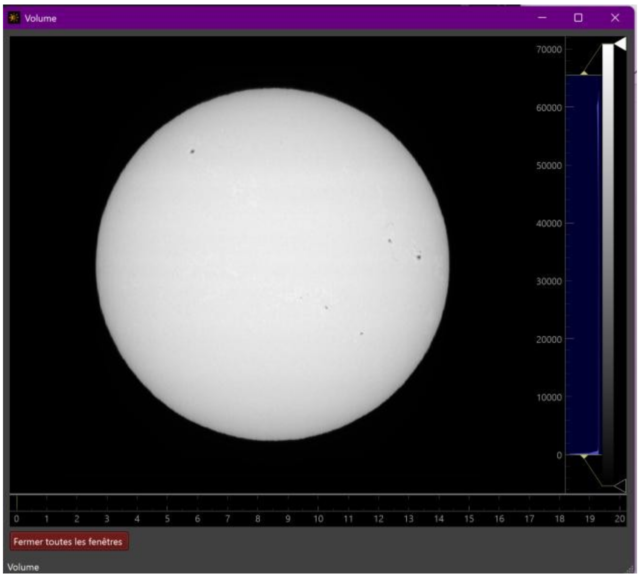
This mode automatically calculates a cube of images, each with a shift of one pixel over a range of +/- n pixels.

The result is saved as an animated GIF file and an MP4 file. It is also possible to

enable saving in 3D FITS format.

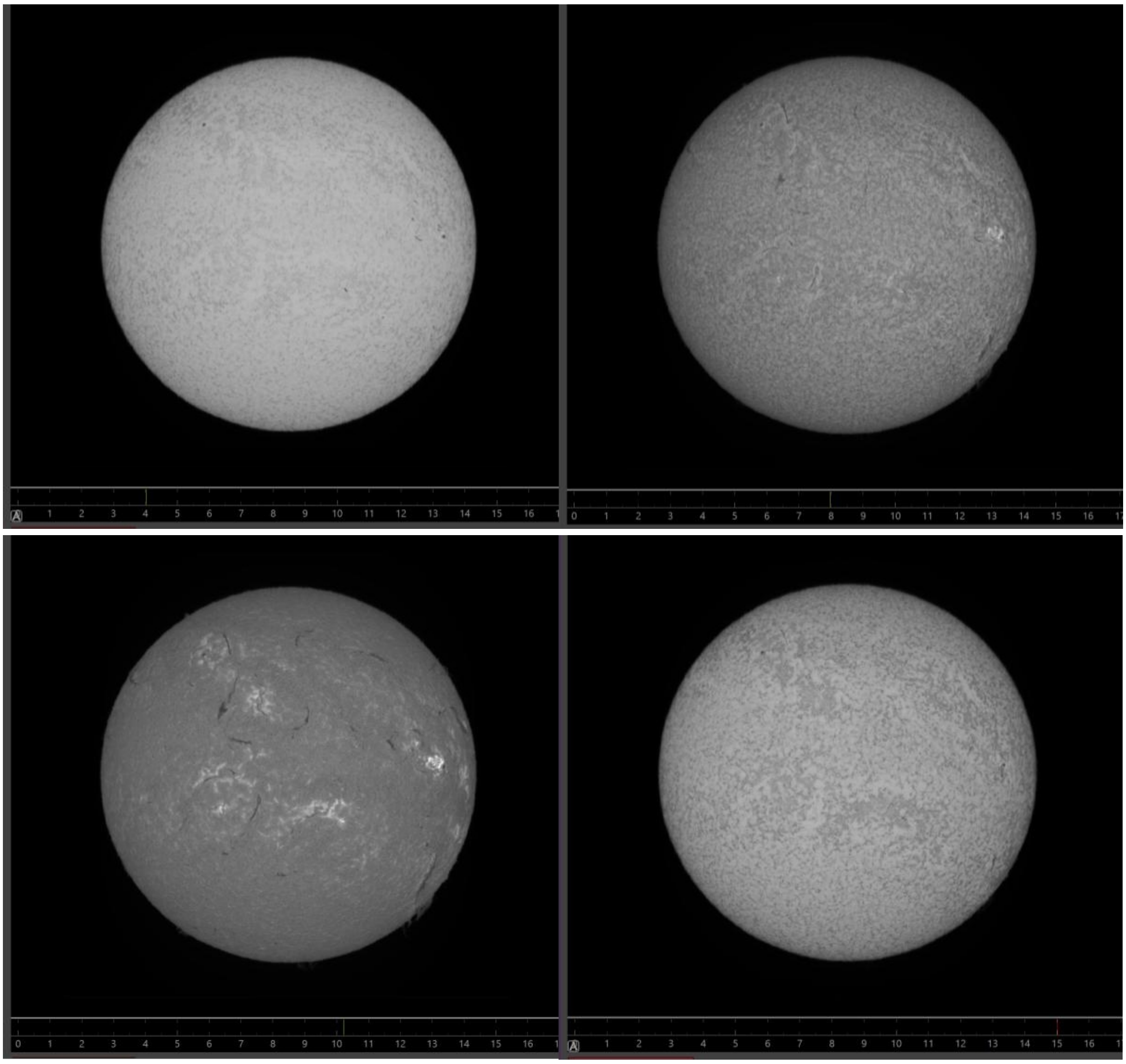


Select a file and specify the exploration range as +/- n pixels. Click Go!



The Volume window displays the image cube. Use the mouse to move the cursor at the bottom of the image
to explore the file frame by frame.

The gif and mp4 files are saved in your observations directory.



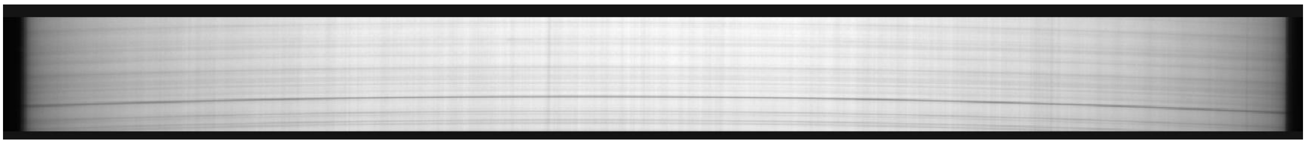
Frames 4, 8, 10 (center), and 15, i.e., -6, -2, 0, and +5 pixels converted to Angstroms -0.75, -0.25, 0, and +0.63 Ang

Helium line processing – Corona – free

A "free line" is a line of low intensity, weaker than any of the lines present in the acquired spectrum region. You must therefore find and indicate to INTI the position of this weak line, which may even be invisible if you are looking for a line that is only visible in emission at the edge of the disk. This is typical of images of helium and the solar corona.

Let's take the use case for producing an image of Helium in the D3 line at 5875 Angstroms (INTI Partner Image – Map)

Here is the image of one of the frames from the SER acquisition file (Image INTI Partner – SER)



Note the presence of a dark spectral line, which will enable INTI to perform its automatic calculation. The position of the helium line, which is almost invisible on the disk but visible in emission at the edge of the disk, still needs to be found.

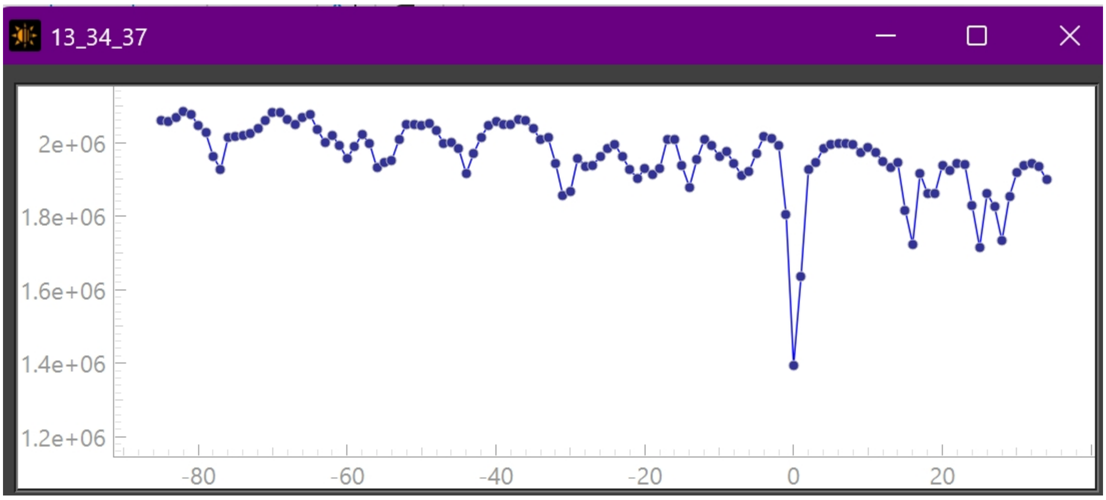


Image of the spectral profile on the disk using the profile tool in the Doppler tab—the darkest line is an iron line and will be the reference line for the automatic calculation. Note that this profile does not allow the position of the helium line to be determined.

In the case of helium, INTI is able to automatically find the emission line without any other information and provide you with interactive tools to confirm this position if necessary.

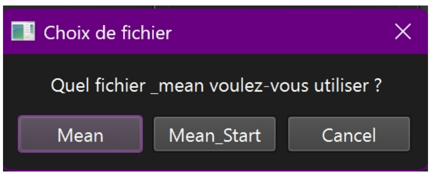
Polynomial coefficients

First, it is necessary to perform an initial processing to find the polynomial coefficients (modeling the curved shape of the slit image)

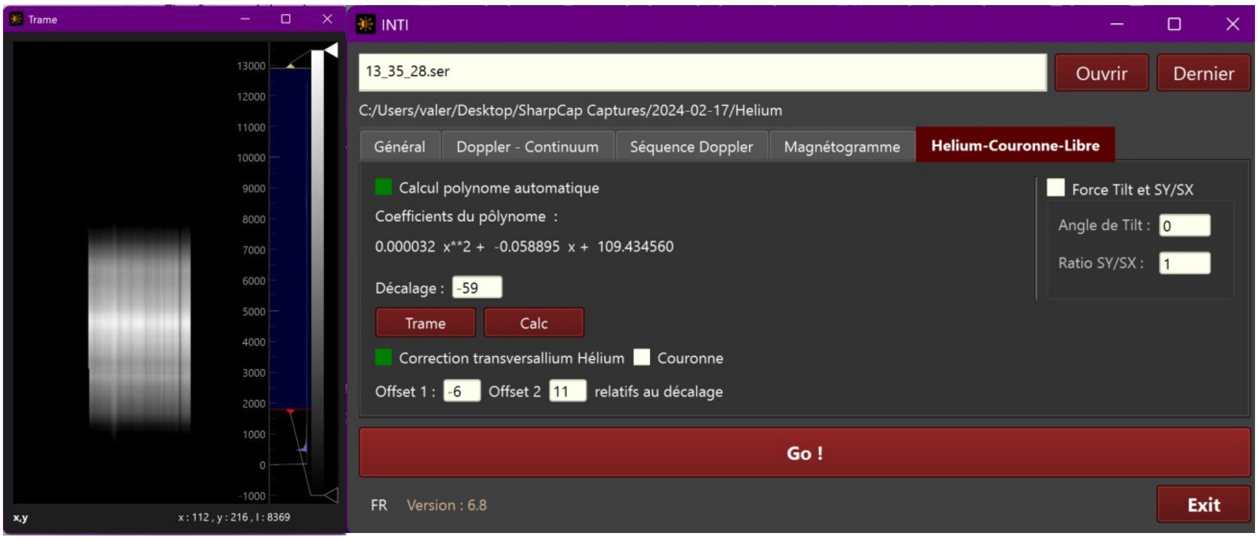
Enter the name of your file, click on automatic polynomial calculation, and press Go!

Automatic location of the helium line position

Click on the "Frame" button—a selection window will appear, offering not the average "mean" frame but a frame automatically calculated by INTI around the appearance of the disk, the "mean_start" frame.



INTI calculates a spectral profile and detects the position of the helium line that appears in emission. The deviation value is updated in the main interface.



On the left, spectral average image when the disk appears; the vertical white line that stands out and is also visible on the background is the helium emission line. On the right, the value of the deviation from the darkest line is updated in the interface. You can change the value: click and then OK.

Important: The offset value is a constant linked to your camera (pixel size and binning factor), so there is no need to recalculate it for each session or each scan. This means that in future, you will be able to process all your Helium scans in just one click!

Note: For math enthusiasts, you can of course calculate the theoretical offset using the calculator accessible via the "Calculator" button. While the pixel size is easy to find, it is sometimes more difficult to remember the binning mode used during acquisition.

Obtaining the Helium image

For a Helium image, you can add a horizontal band correction, a type of transversalium correction, by clicking on Helium transversalium correction. Click on Go!

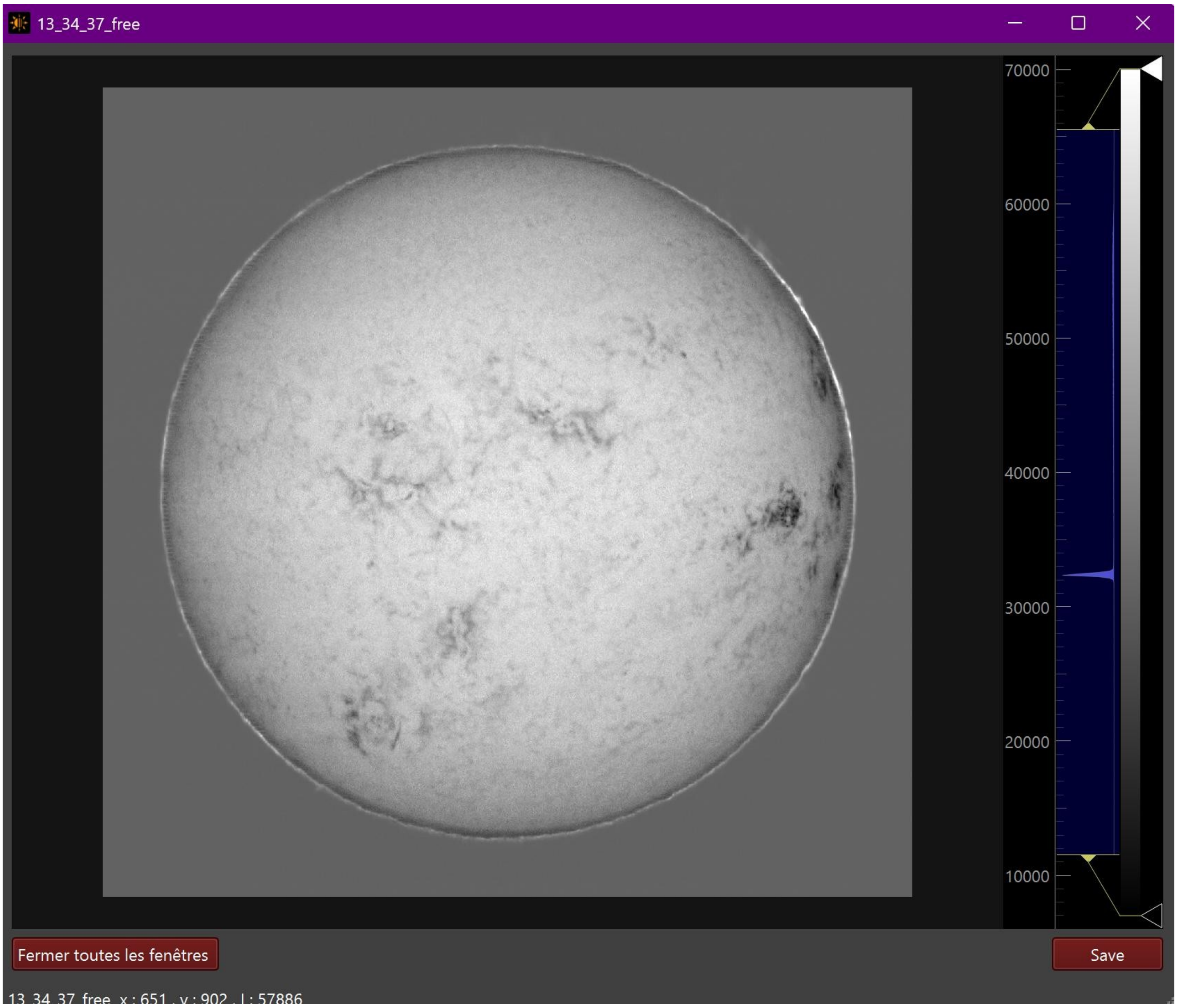
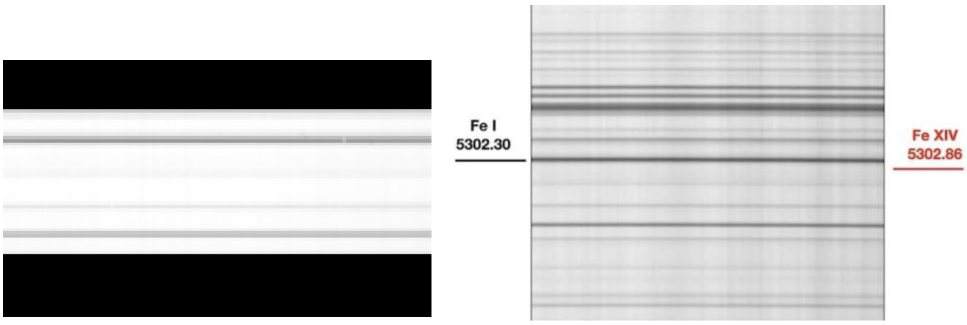


Image of the solar corona

The principle is the same: the coronal line is so faint that it is necessary to rely on a known nearby line. Even if a corona is detected in emission, it is so faint that it is impossible to see it in emission. A little math is needed to calculate the pixel shift that corresponds to the difference in Angstroms between the darkest line and the coronal line.

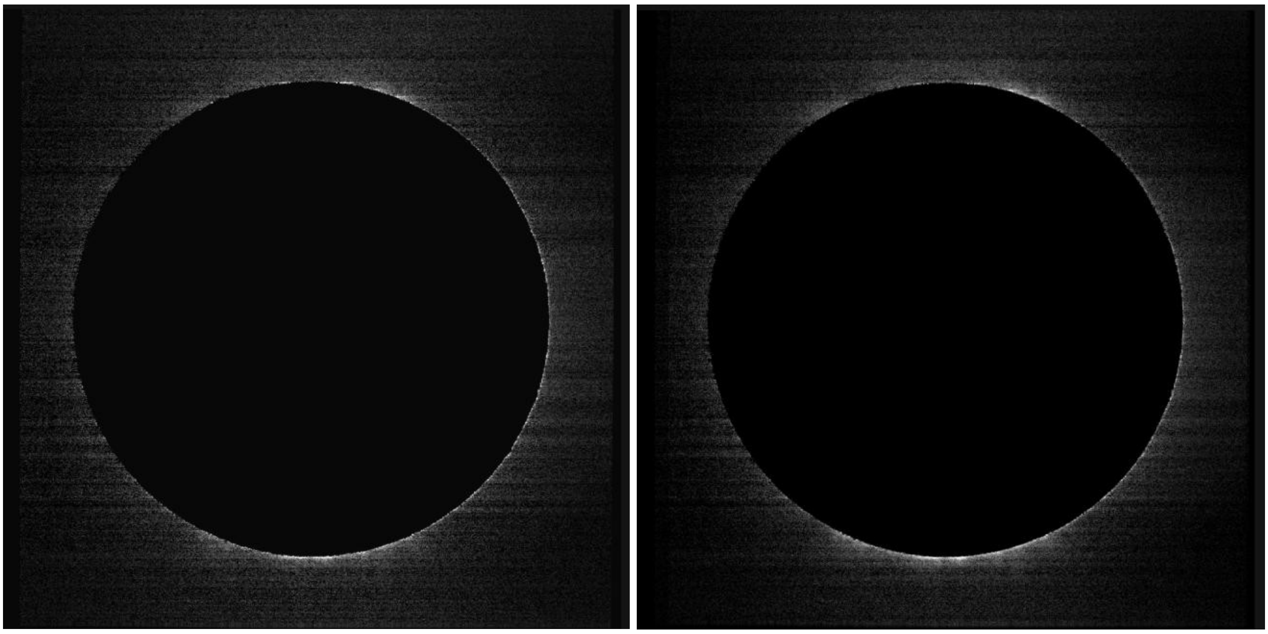
Furthermore, to increase signal quality, it is strongly recommended to perform acquisitions by saturating the spectrum. With the corona mode in INTI, it is no longer necessary to perform an unsaturated scan to calculate the polynomial.



Left: spectrum of an unsaturated scan; right: identification of lines.

The choice of continuum lines is another important factor. It is possible to mistakenly indicate a shift that corresponds to a nearby weak line, as there are many of them in this region.

However, once the shift values have been defined, the automatic polynomial calculation mode applies even to saturated scans, allowing any movements of the slit to be tracked in order to extract the intensities of the coronal line, which is not only very weak but also very narrow.



Left: Image of the corona obtained with a single scan; right: sum of two scans using Inti_partner

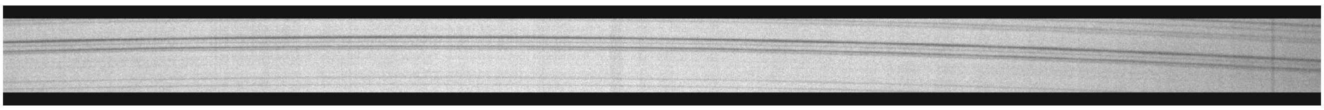
Magnetogram

This reconstruction mode allows images of the solar magnetic field to be created.
The acquisition exploits the Zeeman effect on certain iron lines that are particularly sensitive to magnetic fields. It requires the use of polarizing filters and the acquisition of two scans. Please refer to Christian Buil's video on YouTube on the **astro-spectro** channel.

The processing procedure can be quickly described—the illustrative images are by Olivier Aguerre.

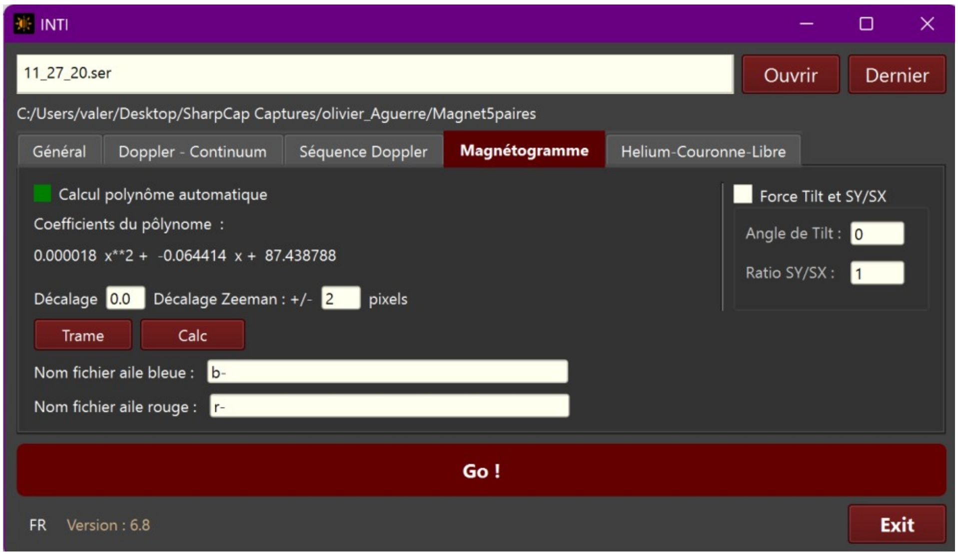
Processing of the first scan – polarization A

Image of a frame from scan A (Image INTI Partner – SER)



The selected Fer ray is the ray at 6302 Ang (Image INTI Partner – Map)

The first step is to determine the difference between the darkest line and the iron line at 6302.



Select the file

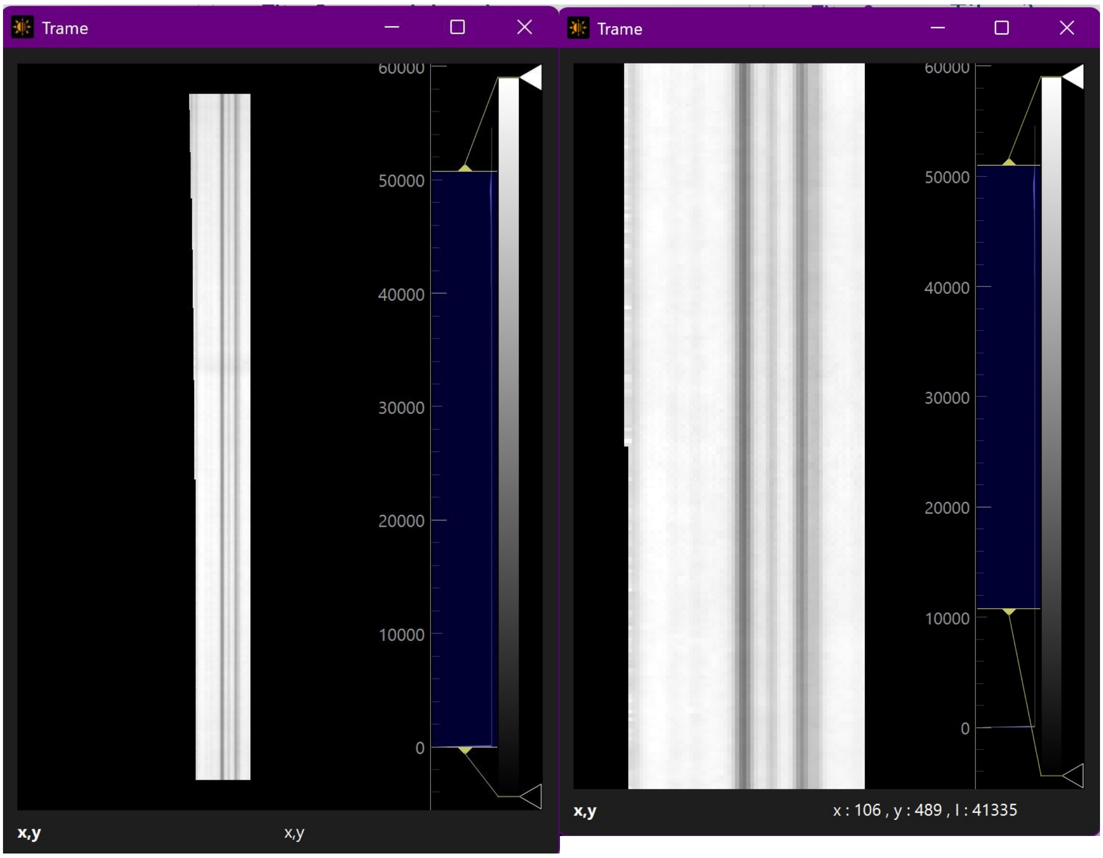
Click on Automatic Polynomial Calculation Click

on Go!

The interesting results are not the images, but the polynomial coefficients that displayed at the end of the processing.

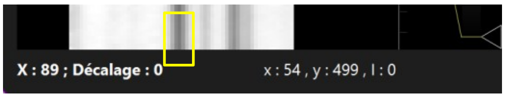
To find the difference, click on the "Raster" button

An Image viewing window displays the spectral image (_mean) with straight lines, as they have been straightened using the polynomial coefficients. You can zoom, move, and adjust the thresholds to focus on the two iron lines.



On the left, the average frame _mean with straightened lines – on the right, a zoom on the two iron lines

You can hover over the image with the mouse and view the intensities. If you click on the darkest line, on the left you will see at the bottom of the window: X:89 (X position on the image) Offset:0 (difference from the position of the darkest line, here 0 since you clicked on that line)

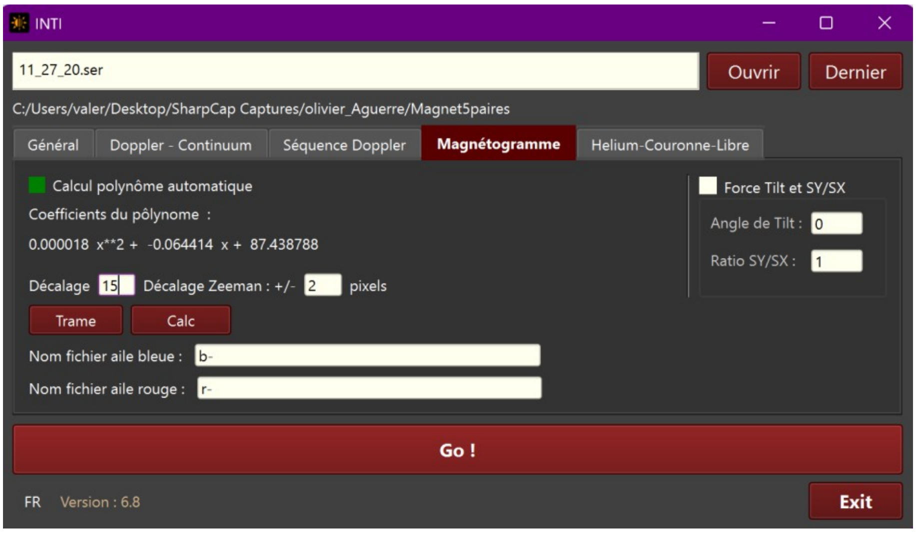


Continuing the overview, we position ourselves on the Fer ray on the right, which is the ray we are interested in.

We then click on its position.

The gap found is 15 pixels. The main interface updates with the mouse click value after confirming with OK.

We can also calculate the theoretical gap using the calculator accessible via the "calculator" button.



The most complicated part is now complete. **This offset value is constant and specific to your camera** (pixel size, binning). It can be calculated using the calculator, but it is ultimately quicker to find it interactively, as we do not always know the pixel size of the camera used or the binning by heart.

INTI calculates two images around this iron line at 6302 angstroms, with an offset of +/- 2 pixels (you can of course change this value): image in the blue wing of the line and in the red wing. The names are prepared by INTI, it is important to respect the hyphen at the end of the name.

As you are processing the first polarization A scan, indicate A in the name (or G for left, or Gauche, but it must be the same prefix in both names).

Click Go!

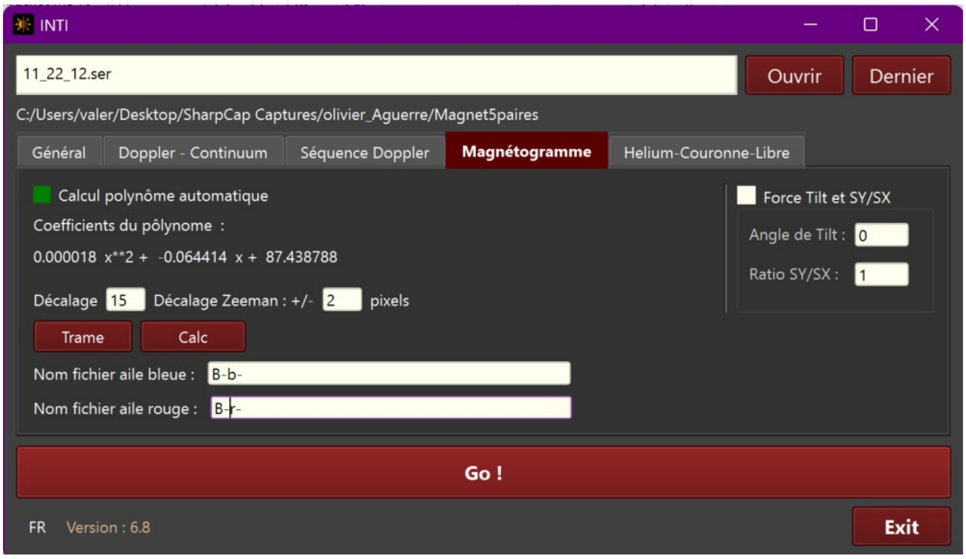
INTI saves the png and fits images A_b-1 and A_r-1

You can process a sequence of several files (batch) and the images will be A_b-1, A_b-2, etc.

Processing the second scan – B polarization

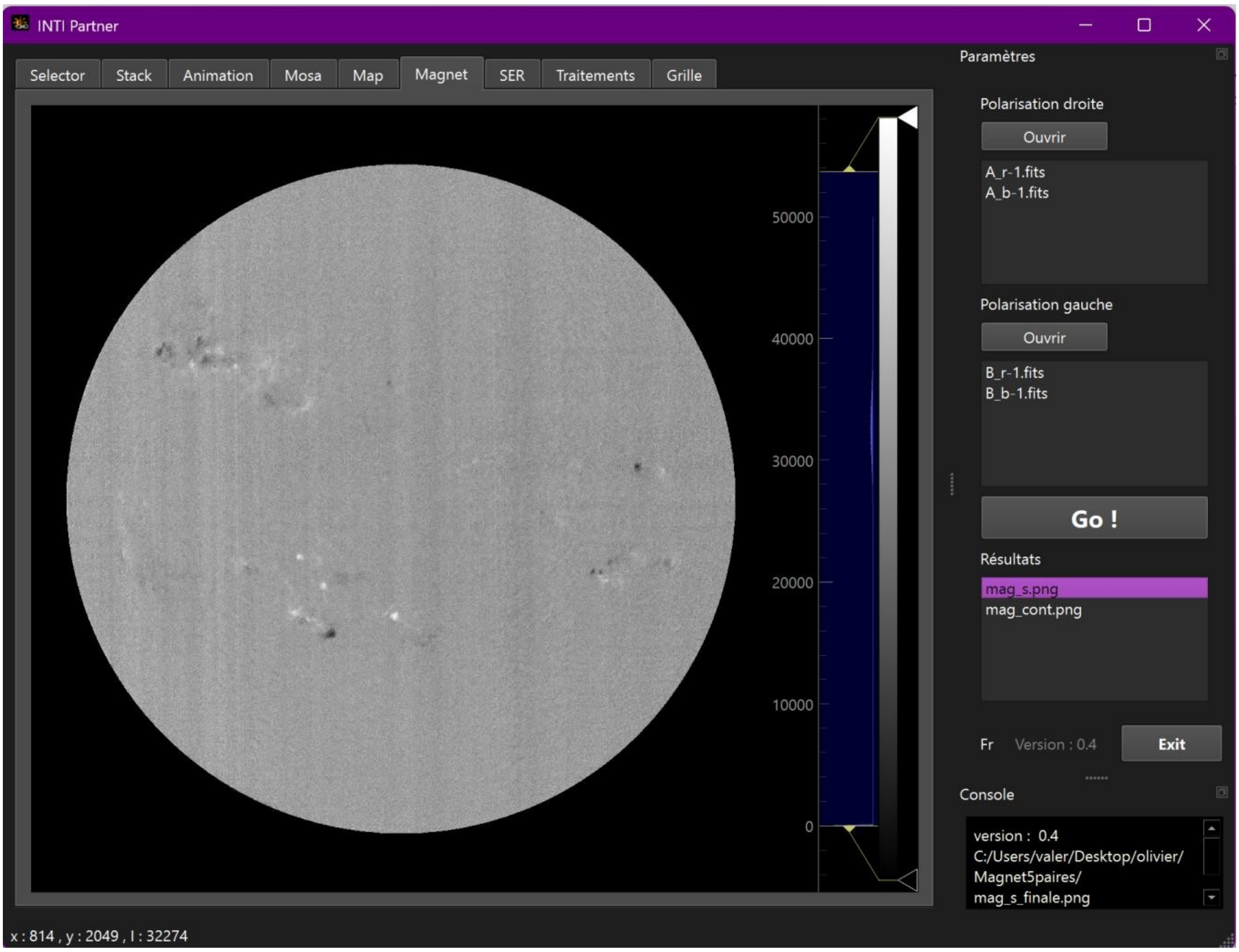
Simply enter the name of the SER file for the second scan (or the names for batch mode), change the names of the blue and red files to B_

Click Go!



In the working directory, you now have four files: A_b-1, A_r-1, B_b-1, and B_r-1

To obtain the final image composition of the magnetic field, you must then go to INTI Partner to launch Christian Buil's magnet application.

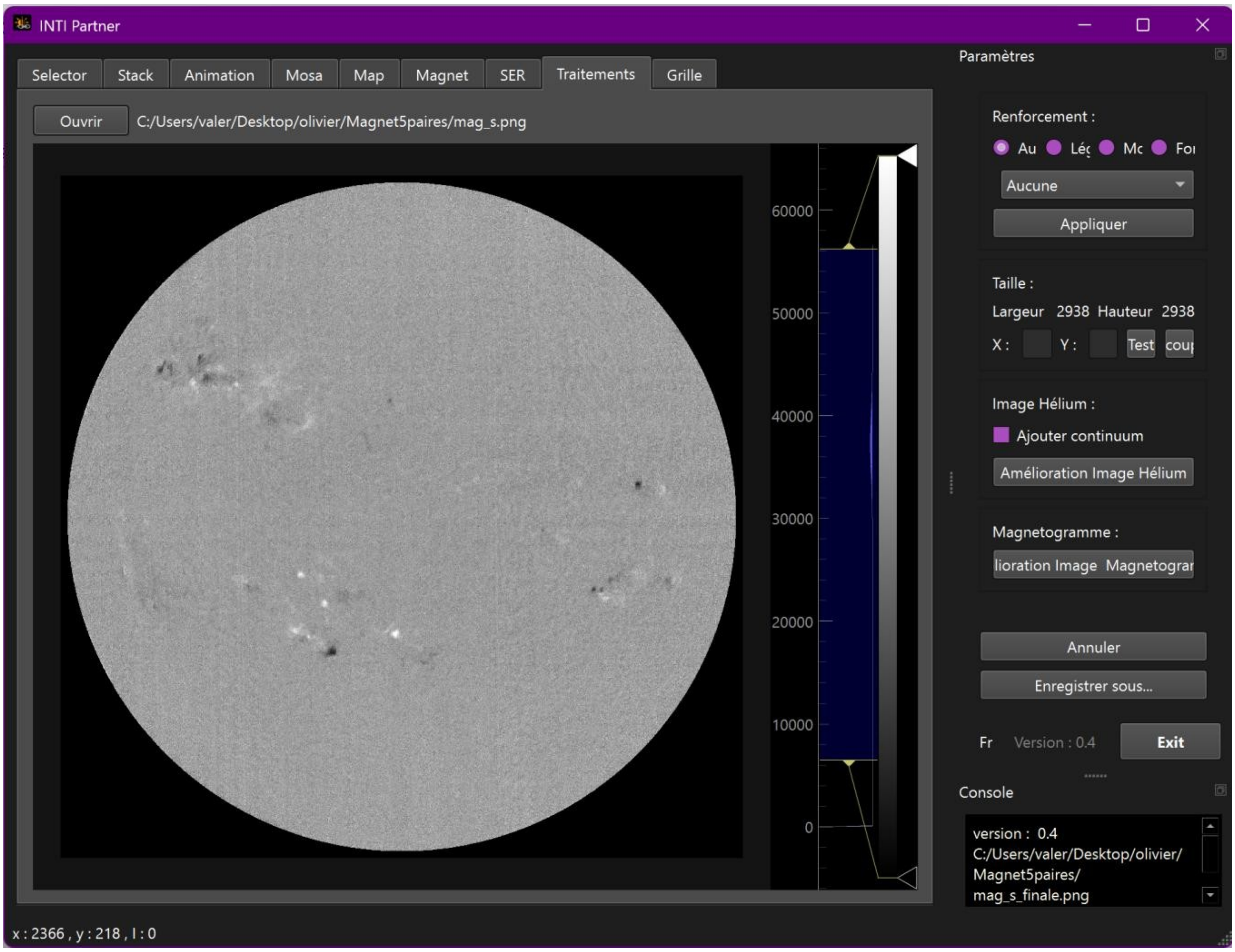


Enter the two right-polarized images (or A) – if you don't know whether it's right or
The left side is not critical; it affects the display values. Enter the two

images of the left polarization (here B).

Click Go! and admire your result in the mag-s.png file.

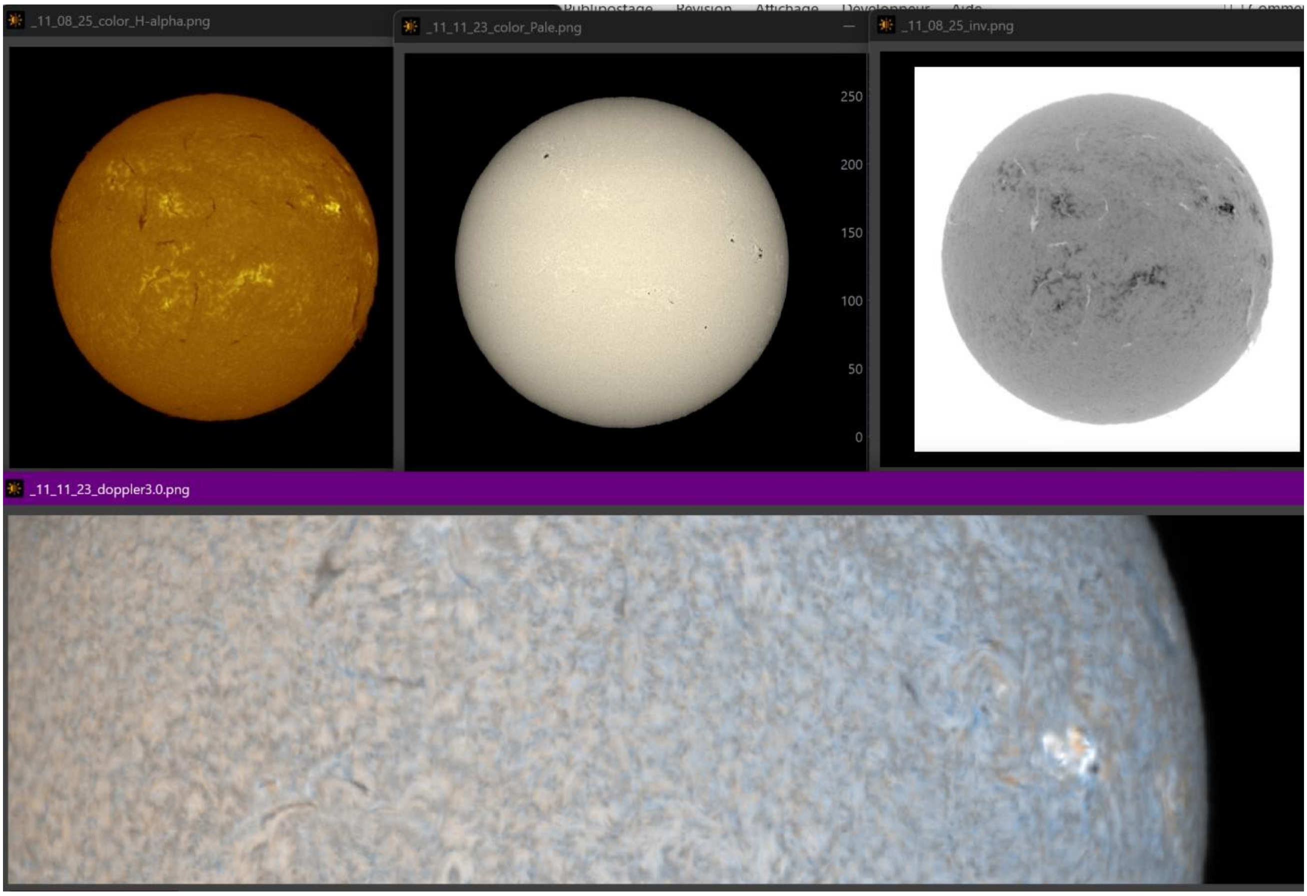
You can perfect your image in the processing tab and correct the vertical bands of transversallium.



To improve image quality, it is not uncommon to perform several consecutive scans in each polarization. Simply select the files and let INTI process them in batch mode. Inti Partner will take care of the additions in the magnet application.

Image visualization

The application allows you to open png image files for quick viewing from the General tab. To do this, simply change the file type selection using the "Open" button and choose, for example, png or fits files.


_11_08_25_color_H-alpha.png
_11_11_23_color_Pale.png
_11_08_25_inv.png
250
200
150
100
50
0
_11_11_23_doppler3.0.png

Details of the inti_ini.yaml file

The INTI_ini.yaml file contains INTI configuration settings and preferences, with the exception of interface management.

At the end of a session, the settings are saved for the next session.

You can edit the yaml file in a text editor.

If you delete the file, or when you first launch INTI, the file will be automatically recreated by the application.

- Directory: last directory of observations
- Dec doppler: Doppler shift +/- in pixels
- Dec cont: shift for the continuum image
- poly_slit_a, poly_slit_b, poly_slit_c: polynomial coefficients
- ang_tilt: tilt angle
- ratio_sysx: geometric ratio for disk circularization
- free_autopoly: forces automatic calculation of the polynomial on the darkest line of the spectrum
- poly_free_a, poly_free_b, poly_free_c: coefficient of the polynomial of the special magnet and free modes
- pos_free_blue: value in pixels of the position where to compute the blue part of the continuum in free line mode
- pos_free_red: value in pixels of the position to compute the red part of the continuum in free line mode
- free_shift: shift to position the extraction at a different place than the polynomial
- force_free_magn: force tilt and scaling ratio with manually entered values
- win_posx: obsolete
- win_posy: obsolete
- screen_scale: obsolete
- observer: alias of the observer for fits header
- site_long, site_lat: site longitude and latitude
- instru: instrument name
- angle P: angle P used – obsolete because updated
- contact: email address
- wavelength: wavelength of the last scan
- wave_label: wavelength label of the last scan
- NS inversion: North-South inversion
- EW inversion: East-West inversion
- autocrop: activates autocrop mode
- ext20pct: 20% horizontal extension of auto crop mode
- crown1 frame: frame1 index
- crown frame 2: frame 2 index
- min slit pos: to recover poorly centered scans - not for use
- max slot pos: to recover poorly centered scans - not for use
- zeeman_shift: offset zeemanreduction_noise: noise reduction mode
- zee_autopoly: forces automatic calculation of the polynomial on the darkest line of the spectrum
- grid disk: generates and saves an image of the Stonyhurst grid
- lang: INTI language

Limitations

The automation of INTI processing is based on a number of assumptions. For example, if the scan does not start before the edge of the sun appears and does not end after it disappears, INTI will be unable to determine the geometry of the acquisition. If the exposure is too low, the lack of contrast can also interfere with edge detection.

The video format is SER format only, in 8 or 16 bits, black and white, SER format.

INTI is no longer compatible with Windows 7, as Windows 7 is not compatible with versions of Python versions higher than 3.9

INTI has been extensively tested by Christian Buil and myself on numerous configurations. We are confident that it produces reliable results. However, we encourage you to contact us with any questions, problems, or suggestions.

References

INTI is an original work that forms an integral part of the Sol'Ex project. If you use any elements or are inspired by how it works, please refer to: Sol'Ex - INTI by Christian Buil & Valerie Desnoux

Contributions

Ser files are read using a Python library developed by Jean-Baptiste Butet, with SER timestamp decoding by Matt Considine.

The Ellipse fitting adjustment module is a Python module by Ben Hammel & Nick Sullivan-Molina. (2020, March 21). bdhammel/least-squares-ellipse-fitting: v2.0.0 (Version v2.0.0).

The Python code is available at **https://github.com/Vdesnoux/inti**

Appendix

To run an unsigned program on MacOS Place the file in

a directory of your choice.

Before unzipping, open a Mac terminal console and enter the command: sudo xattr -cr /pathtofile/specinti_mac.zip

Replace /pathtofile/ with the path to your zip file

If your file is already unzipped, specify the directory path

Since the sudo command is a supervisor command, the terminal will ask for a password

Enter your Mac account password using the keyboard and press Enter. When you enter the password, nothing will happen on the screen. If the result is correct, the terminal will not display any error messages.

You can then unzip your file or access the directory directly. The first time you launch the application, the loading time is long and can take up to two minutes, so please be patient... this will not be the case for subsequent launches.